



DOT Positioning, Navigation, and Timing Update

CNAV Activation and Civil Signal Monitoring Plans

Space-Based PNT Advisory Board

June 3, 2014

L2C and L5 CNAV Early Implementation

Bottom Line Up Front:

- Pre-Operational CNAV Messages Broadcast on L2C and L5 Began April 28th
- L2C Set Healthy; L5 Set Unhealthy
- Use at Your Own Risk
 - Not To Be Used for Safety-of-Life or Other Critical Applications
- Great Cooperation by CNAV Tiger Team Tri-Chaired by OSD, AFSPC, and DOT



CNAV Test Plan - 2013

▪ AFSPC CNAV Test Plan, Federal Register Notice, March 20, 2013

“U.S. Air Force Space Command **expects to conduct one to two CNAV tests per year over the next few years.** These test events will provide an opportunity for civil users and manufacturers to participate in L2C/L5 evaluation and will result in enhanced provider and user readiness for L2C/L5 operations once the Next Generation GPS Operational Control System comes online in 2016. “

▪ AFSPC Press Release, June 14, 2013

As part of the GPS Modernization effort, the Space and Missile Systems Center, Global Positioning Systems Directorate (SMC/GP) will execute Civil Navigation (CNAV) message testing in June 2013 and **will execute similar tests at least annually.**



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Initial Concerns with Early CNAV Message Implementation of L2C/L5

- CNAV Test identified 4 issues: 2 GPS IIF SVs and 2 operational
 - Importance of signal monitoring
 - Opportunities for Human Error
- Tested only 8 of 15 CNAV message types
- Lack of L2C & L5 Performance Standards
- No validated requirement for early implementation
 - Ionospheric corrections currently available with Message Type 0
- 2013 Federal Register Notice only referred to testing until OCX became operational

- ❖ CNAV Tiger formed in December 2013 to address concerns



CNAV Tiger Team Outreach Results

- Six Comments Received Through Federal Register Notice:
 - 1 GPS Receiver Manufacturer
 - 2 Government Representatives
 - 3 Independent Consultants
- Two comments received not through FRN:
 - International GNSS Service (IGS)
 - FAA
- Input insufficient to be truly representative of any user group

The Bottom Line:
No one stated “don’t do it”, yet no one stated “I need this now”



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CNAV Tiger Team Findings / Open Items

Findings:

- Results from outreach very limited, but revealed no risks/issues beyond those identified by the Tiger Team
- Tiger Team identified 8 risks/concerns and associated mitigations

Open items:

- Conduct follow-on testing of additional CNAV message types (TBD)
- Update SPS Performance Standard (CY 2017)
- Implement signal monitoring capability

ESG Co-Chair Recommendations:

- Set L2C healthy; leave L5 unhealthy until signal monitoring implemented
- Ensure awareness of “use at your own risk”
- Retain Tiger Team to monitor CNAV implementation progress and address any issues that may arise



GPS Civil Signal Performance Monitoring

CMPS Document Issued by DOT in December 2005, rev. April 2009

- Adopted by civil agencies as requirements for civil signal monitoring of GPS
- Two key categories of monitoring requirements
 - Those that result in timely notification (minutes) of GPS operators to take action
 - Those that report GPS service performance levels against stated commitments, e.g. GPS SPS-PS
- Explicit statement of what civil signal monitoring means
 - Metrics verification
 - Archive and retrieval of monitoring data and performance levels
 - Signal quality and navigation message monitoring
 - GPS Operator notification
 - Civil User notification



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Civil Signal Monitoring Trade Study

Cost, effectiveness, & risk analysis of OCX/Non-OCX (Mar 2014)

- **Three sources of study data**
 - OCX: ROM estimate on prioritized CMPS-defined requirements
 - Non-OCX: ROM estimate on full CMPS-defined requirements
 - GPS Operators: Current procedures, OCX OPSCON
- **Wide ranging study review team**
 - OST-R, FAA, 2SOPS, AFSPC/SMC/GP-GPC-GPE representatives
 - CMPS primary authors

Recommendations on Path Forward

- Pursue a dual implementation with OCX and Non-OCX elements
- Engage with USAF on integrating Non-OCX monitoring into GPS operations



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